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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/960,398	09/24/2001	Masaki Kurasawa	011254	5650

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EXAMINER
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LE, THAO X

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 03/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/960,398

Applicant(s)

KURASAWA ET AL.

Examiner

Thao X. Le

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 01 November 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1,2,5,6,9,10,13-28,30 and 31 is/are pending in the application.
- 4a) Of the above claim(s) 15-28 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1,2,5,6,9,10,13,30 and 31 is/are allowed.
- 6) ☒ Claim(s) 14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 6573553 to Nakamura in view of US 6294860 to Shimada et al.

The applied reference has a common Assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an

invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). For applications filed on or after November 29, 1999, this rejection might also be overcome by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person. See MPEP § 706.02(I)(1) and § 706.02(I)(2).

Regarding claim 14, Nakamura discloses a semiconductor device in fig. 4B comprising a memory cell transistor, fig. 2A, formed on a semiconductor substrate 11 and including a gate electrode 14, column 14 line 10, and source/drain diffused layers 18, column 14 line 15, formed in the semiconductor substrate respectively on both sides of the gate electrode 14, fig. 1A; an insulation film 14, column 14 line 41, covering the semiconductor substrate 11 with the memory cell transistor formed on; a contact plug 25, column 14 line 44, buried in the insulation film 25 and electrically connected to one of the source/drain diffused layers 18, fig. 2A; a barrier metal layer 28, column 15 line 9, formed on the contact plug 25 and the insulation film 24; and a capacitor formed over the insulation film 24, and including a lower electrode 29, column 14 line 65, formed on the barrier metal layer 28 and having a width larger than that of the barrier metal layer

28, fig. 4B; a capacitor dielectric film 32, column 15 line 29, formed on the lower electrode 29, and formed of a perovskite ferroelectric material, column 28 line 67, having a larger thermal expansion coefficient than that of the semiconductor substrate 11; and an upper electrode 33, column 15 line 30, formed on the capacitor dielectric film 32, the lower electrode 29 having a height larger than a width thereof and being not in contact with the insulation film 25 so as to suppress a stress applied to the capacitor dielectric film caused by a thermal expansion coefficient difference between the substrate and the capacitor dielectric film.

But Nakamura does not disclose the semiconductor device wherein the capacitor dielectric film 32 having a crystal oriented substantially perpendicular to a surface the lower electrode 29.

However, Shimada reference discloses a capacitor structure in fig. 2 comprises a substrate 10, a buffer layer 11/11A, a lower electrode 12, a perovskite ferroelectric (PZT) material having a crystal oriented substantially perpendicular to a surface of the lower electrode, see abstract. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the PZT crystal orientation teaching of Shimada to replace the capacitor dielectric film 32 of Nakamura, because it would have provided a high piezoelectric strain constant and a good adhesion with a lower electrode, which can be produced without being cracked as taught by Shimada, see abstract.

With respect to the perovskite ferroelectric material having a larger thermal expansion coefficient (CTE) than that of the substrate, it is known that Si

has the CTE about  $3 \times 10^{-6}/\text{C}^\circ$ , while the metal oxide such as  $\text{Ta}_2\text{O}_5$ ,  $\text{TiO}_2$ ,  $\text{HfO}_2$ , has the CTE about  $>7 \times 10^{-6}/\text{C}^\circ$ .

With respect to suppress stress applied to the capacitor dielectric film caused by a CTE difference between the substrate and the capacitor dielectric. This function is obvious in the structure because the when the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be either anticipation or obviousness. *In re Best*, 195 USPQ 430, 433 (CCPA 1977).

#### ***Allowable Subject Matter***

3. Claims 1-2, 5-6, 9-10, 13, and 30-31 are allowed because the prior art of record neither anticipated nor rendered obvious all the limitations of the base claim 1 and 13 including the buffer layer structure is formed of an insulating material.

#### ***Response to Arguments***

4. Applicant's arguments filed on 15 Feb. 2005 have been considered but are moot in view of the new ground(s) of rejection.

#### ***Conclusion***

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X. Le whose telephone number is (571) 272-1708. The examiner can normally be reached on M-F from 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on (571) 272 -1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

LONG PHAM  
PRIMARY EXAMINER

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thao X. Le  
09 Feb. 2005